CHAPTER 4

Diseases

4.1 Introduction

Health: is a state of complete physical, mental and social well being and not merely the absence of disease.

Disease may be defined as a state in which the normal functioning of the body is disturbed.

After the invention of the microscope in 1835 and through the work of Robert Koch and Louis Pasteur, it became clear that diseases are caused by germs.

Types of disease

(i) Genetic disease like Down's syndrome, haemophilia etc.
(ii) Nutritional deficiency diseases like scurvy, goiter etc.
(iii) Metabolic or hormonal disorder like diabetes, cretinism etc.
(iv) Physical disorders due to accident, injury, heat, cold, radiation.
(v) Pathogenic or infectious diseases due to other living organisms like diphtheria, tuberculosis etc.
(vi) Ageing or degenerative diseases like osteoarthritis, arteriosclerosis etc.

Diseases may be classified into communicable or infectious and non-communicable or non-infectious diseases. The communicable diseases are caused by microorganisms like viruses, bacteria, fungi and protozoa.

4.2 Diseases caused by Bacteria

Disease	Pathogen and mode of transmission	Symptoms
1. Pneumonia	***Diplococcus pneumoniae***, by contact or air.	Infection of lungs.
2. Cholera	***Vibrio cholerae***,by contaminated food and water.	Vomiting, loose motion, dehydration.
3. Typhoid	***Salmonella typhi***, by vector like flies or by contaminated food.	Continuous fever, intestine often affected, relapse may occur.
4. Tuberculosis	***Mycobacterium tuberculosis***, by air,dust,cough of infected person.	Breathlessness,pain,weight loss.
5. Whooping cough/Pertussis	***Haemophilis pertussis***,by discharge from throat of infected person.	Coughing and difficulty in inspiration.
6. Leprosy (Hansen's disease)	***Mycobacterium leprae***, trasnsmitted only by prolonged physical proximity.	Gross deformities in tissues.
7.Tetanus	***Clostridium tetani***	Muscular action is hampered leading to muscular spasms.
8. Diphtheria	***Corynebacterium diphtheriae***,by discharge from throat of infected person or by sneezing and coughing.	Throat is affected, occurs generally in children.
9. Gonorrhoea	***Nesseria gonorrhoea,*** spread by sexual contact.	Burning and pain during urination, leads to sterility.
10. Syphilis	***Treponema pallidum,*** spread by sexual contact.	Affects mucous membrane of genital tract, rectum and mouth.
11. Plague	***Yersinia pestis,*** spread by air, by direct contact or by contaminated under- cooked food or materials, bite of infected fleas (*Xenopsylla cheopis*).	Flu like symptoms, sudden onset of fever, chills, head and body ache, vomiting and nausea.

ALLEN

Types of diseases - on the basis of duration

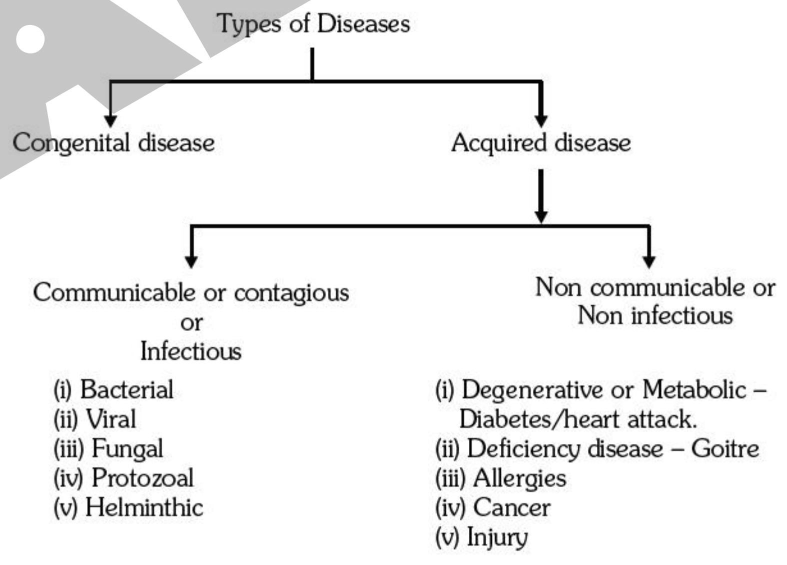
1. **Acute disease -** A disease that occurs suddenly and lasts for a short time is called acute disease, e.g. common cold, malaria. Once treated these diseases generally do not have long term effect.

2. **Chronic disease -** A disease that lasts for a long time is called chronic disease. These diseases generally cannot be cured completely. Only their symptoms can be controlled with medicines, e.g. Tuberculosis, asthma.

Differences Between Acute and Chronic Diseases

S.No.	Acute Disease	Chronic Disease
1	**Duration :-** It is of shorter duration.	It is longer duration disease.
2	**Persons :-** Every person suffers from an acute disease at one time or the other.	Only some persons suffer from chronic diseases.
3	**Body Damage :-** Being of short duration, it does not damage any organ.	It does damage the affected organ due to prolonged duration.
4	**Recovery :-** The recovery is generally complete after the treatment.	The recovery is seldom complete even after treatment.
5	**Effect :-** There is neither loss of weight nor feeling of weakness.	There is often a loss of weight accompanied by feeling of tiredness.
6	**Loss :-** Interruption of work and loss of efficiency are of short duration. For Example, Diarrhoea, Typhoid.	Interruption of work and loss of efficiency are prolonged. For Example, Tuberculosis, Diabetes.

Types of disease - On the basis of occurence


Types of Diseases
Congenital disease
Acquired disease
Communicable or contagious or Infectious
Non communicable or Non infectious
(i) Bacterial
(ii) Viral
(iii) Fungal
(iv) Protozoal
(v) Helminthic
(i) Degenerative or Metabolic – Diabetes/heart attack.
(ii) Deficiency disease – Goitre
(iii) Allergies
(iv) Cancer
(v) Injury

Congenital disease : They are caused either due to genetic disorders or environmental factors or hereditary diseases, e.g. Haemophilia, sickle cell anaemia, diabetes etc.

ALLEN

Acquired disease : They are acquired by organisms after birth, not heritable.

Communicable disease : The infectious agents (microbes) can move from an affected person to a healthy person, so the infectious diseases are also known as communicable diseases.

Non-communicable disease : These do not spread from person to person.

Non-infectious disease : A disease that is not caused by an infectious agent is called a non-infectious disease, e.g. Diabetes, cancer.

Degenerative disease : Disease of old age due to gradual decline in functioning of body organs.

Deficiency disease : Disease caused by deficiency of one or more nutrients in diet. e.g. Night-blindness (Vitamin-A).

Allergies : They are caused due to hypersensitivity of the body to any foreign substance. e.g. Asthma.

Cancer : Uncontrolled division of cells in any part of the body to form mass of cell. e.g. tumor.

4.3 Diseases caused by Viruses

Viruses are extremely small particles made up of nucleic acids and proteins which are visible only through electron microscope.

Disease	Pathogen and mode of transmission	Symptoms
1. Chicken pox	***Varicella zoster virus***, by contact with infected person.	Skin breaks out with rashes accompanied by fever, headache and general discomfort.
2. Common cold	***Common cold virus***, by droplet infection.	Profuse nasal discharge, headache.
3.Influenza	***Influenza virus***, by droplet nuclei.	Fever , muscular aches and pain.
4. Measles	***Rubeola virus***, contact with infected person.	Fever, rash, red watery eyes, running nose.
5. Mumps	***Mumps virus***, by physical contact, droplet infection.	Shivering, headache, fever, swollen salivary gland in neck.
6. Poliomyelitis	***Polio virus***, by secretion of nose, throat and excreta.	Fever, sore throat, muscular pain and paralysis of leg in children.
7. Rabies	***Street virus***, a canine disease transmitted to human through the bite of a rabid animal though its saliva.	Hydrophobia, the virus selectively attacks the brain.
8.AIDS	***HIV***, by unprotected sex and blood transfusion.	Weight loss, loss of immunity.

ALLEN

4.4 Diseases caused by Protozoa

Disease	Pathogen	Host/transmission	Symptoms
1. Malaria	***Plasmodium vivax, P. malariae, P. falciparum***	Female anopheles mosquito.	Chill and shivering, pale face.
2. Giardiasis or diarrhoea	***Giardia intestinalis***	Human; inhabit upper part of small intestine.	Interferes with fat metabolism, abdominal pain, loss of appetite, headache.
3. Amoebiasis	***Entamoeba histolytica***	Man	Bleeding, ulceric dysentery, mucus with stool, forms abscess in organs.

4.5 Diseases by Worms

Disease	Pathogen	Host/transmission	Symptoms
1. Taeniasis	***Taenia solium***	Primary host: man's intestine.	Abdominal pain, indigestion.
2.Ascariasis	***Ascaris lumbricoidas***	Man	Fever, intestinal obstruction.
3.Filariasis/ Elephantiasis	***Wuchereria bancrofti***	In lymphatic vessels and lymph nodes of man only. Primary host : man, intermediate host: mosquito.	Lymphatic obstruction by microfilaria, swelling, pain, affected parts are mainly testis,breasts,hand,feet enlarged enormously.

ALLEN

Means of spread of infectious diseases

Medium for spread of the disease	Processes of spread of the disease	Name of Diseases that can be spread this way
Air (Airbone Diseases)	• Sneezing and coughing of infected person causes tiny droplets of liquid containing bacteria/viruses to come out (droplet infection).	Common cold, Pneumonia, Tuberculosis, Influenza, Measles.
Food and Water borne Diseases	• Food is contaminated by pathogens when patient do not have clean habit or flies that feed on sewage sit on food. Pathogens can get into water bodies when rainwater carries excreta/sewage into them.	Cholera, Typhoid, Hepatitis.
Through contact	• When skin comes in contact with an infected person. • By touching things like clothes, bedsheets etc. used by infected person.	Scabies, Herpes, Ringworm, Conjunctivitis
Through body fluids	• By sexual contact (STD) • Through blood, semen or mother's milk.	AIDS, Syphilis, Hepatitis B.
Through vectors	• An animal that spread disease is a vector. E.g. Mosquitoes, flies, cockroaches, rats.	Malaria, Typhoid, Kala-azar

4.6 Treatment to Infections

When we get an infectious disease, our doctor may prescribe different medicines. Some of them reduces the symptoms of the disease, while others kill the disease-causing organisms (pathogens).

Eliminating Infectious Agents

As you know, infectious diseases are caused by bacteria, viruses, fungi, protozoan parasites and worms. These infectious agents differ from each other in many ways. So, a drug that kills one type of infectious agent, does not work on others. However, within a type of organism like, say, bacteria, there are a number of similarities in structure and life processes. So, a drug may work against a number of species of bacteria. Therefore, in our fight against these infectious agents, it make sense to focus on each kind of infectious agent separately.

Biochemical pathways

The cells of a living organism are biochemical factories. A large number of processes go on inside a cell. These processes result in the production of energy, chemical compounds, etc., which one needs for various life functions. A large number of reactions are usually involved in these processes.

A chain of reactions occurring inside an organism to produce a compound is called a biochemical pathway.

For example, a biochemical pathway inside a cell is used for making pyruvic acid from glucose that means the pathway consists of a series of reactions that leads to the formation of pyruvic acid. Pyruvic acid is needed for energy production. So, in an organism, if any reaction in this pathway is prevented from taking place, pyruvic acid will not be formed. This will stop energy production and harm the organism.

Targetting biochemical pathways to fight infectious agents

Scientists study the biochemical pathways of infectious agents to find out which of these can be attacked by a drug. Drugs are chemical compounds. A drug usually targets a particular reaction in a pathway. The drug reacts with a compound taking part in that reaction and forms a product that is different from the normal product of the reaction. This prevents the next reaction in the pathway from taking place. In this way, a substance needed by the organism is not allowed to form. This may kill the organism or stop it from multiplying. Based on this principle many drugs have been made to fight organisms like bacteria and fungi.

Antibiotics

Antibiotics are drugs used to cure diseases caused by bacteria and fungi. There are different kinds of antibiotics which attack different processes and structures in bacteria to kill them or to stop their growth. Bacteria, as you know, are single celled organisms. One type of antibiotic stops the production of a compound needed for the growth of the cell wall. This prevents the cell wall from expanding when the other parts of the cell are growing. As a result, the cell bursts, which kills the bacteria. Penicillin, an important antibiotic, works in this way. Other types of antibiotics work by interfering in other processes such as the production of proteins.

Antibiotics do not work on viruses because viruses are quite different from bacteria. First, viruses are not made up of cells. You can think of a virus as a small particle of some genetic material (DNA or RNA) inside a cover of protein. It does not have cytoplasm and cellular organelles where biochemical reactions occur. To multiply, it enters the cell of a living organism, which becomes its host. The cellular resources of the host are used to produce many copies of the virus. As viruses lack cells, biochemical processes which occur in cells are missing in viruses. Since these biochemical processes are the targets of antibiotics, antibiotics do not work on viruses.

4.7 Specific prevention of infectious diseases

Specific prevention of infectious diseases is provided by the immune system when it produces some specific molecules called antibodies to fight against specific invading microbes or their products, called antigens. Antibodies are proteins made by the white blood cells called lymphocytes, in response to any foreign substances, called antigens, in order to detect them, bind with them and destroy them. Antigens are usually proteins. They can

ALLEN

be present on the surface of bacteria and viruses. The harmful chemicals that bacteria and viruses secrete can also be regarded as antigens. Antigens are of many types. For each type of antigen, the body produces a corresponding antibody to bind with it and destroy it. The antigen-antibody binding is highly specific. An antibody binds with an antigen to destroy it in the following ways.

1. Specific antibodies bind with the antigens on the microbes making them more likely to be engulfed and destroyed by phagocytes (WBC).
2. Antibodies combine with the antigens, toxic chemical to make them harmless.
3. Antibodies bind with antigens to destroy them.
4. Some antibodies bind to the antigens on the microbes and make them stick together so they cannot multiply.

The immune system has a memory of the invading microbes. It recognizes them and fights them later if they invade again. When an infectious agent invades for the first time, the antibodies are produced slowly. After destroying the antigens, they remain in the body. When there is a second infection, the circulating antibodies recognize the specific antigens and more antibodies are produced much faster this time.

As a result, we do not suffer from the severe form of the disease. For example, if we have had mild chickenpox once, we will not suffer from its severe form later.

When nurses working in hospitals taking care for patients with various diseases, they too are exposed to various antigens. Their body responds by producing antibodies against those antigens. Therefore, although they may suffer from the mild forms of those diseases, they remain protected from their severe forms. That a mild attack of a disease may prevent a more severe attack later on, forms the basis of immunization.

Immunization

Immunization is stimulating the body to produce antibodies by artificial means. These antibodies fight against infections later. You can be immunized against certain diseases by taking vaccines for them. A vaccine is a preparation of weakened-infectious agents or their products that can be injected or given orally to prevent specific diseases. Vaccines help in the specific prevention of diseases. Today there are many types of vaccines available to prevent infectious diseases. Nowadays, vaccines are available against tetanus, diphtheria, whooping cough, polio, chickenpox, measles, mumps, typhoid, tuberculosis, hepatitis and many other diseases. Many of these vaccines are given to children under the public health programme of childhood immunization.

Smallpox vaccine

An immunization programme was carried out earlier to eradicate smallpox. Earlier, in smallpox epidemics people were afraid of going near someone suffering from it. Smallpox was controlled and eradicated with the help of a vaccine. There is an interesting story about how the smallpox vaccine and the concept of vaccination came into existence. An English physician, Edward Jenner (1749-1823) observed that people who got cowpox a mild disease, did not suffer from smallpox, a more severe disease. Usually, the girls who milked cows got cowpox, a disease that causes rashes on the hands. Jenner decided to test his observations about cowpox and smallpox.

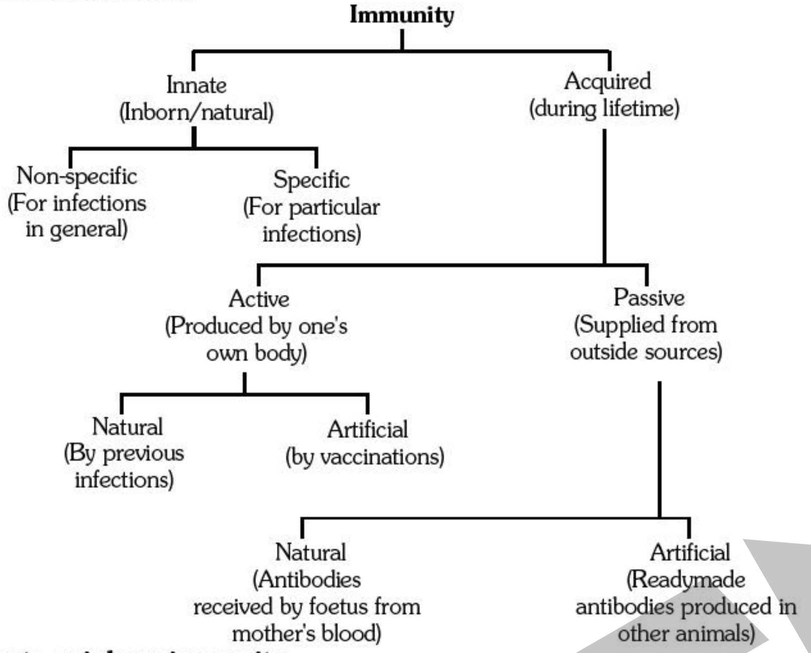
Jenner took some pus with a sterile needle from the cowpox rashes of an infected girl and injected it into scratches made in the skin of an uninfected boy, who soon got cowpox. After he recovered, Jenner injected the boy's arm with pus from the spots of a person suffering from smallpox. Luckily, the boy did not get smallpox and Jenner's experiment was successful. It tells us how Jenner made the first vaccine against smallpox using the microbes of cowpox, a similar but less severe disease.

Immunity

ALLEN

Resistance of the body against a specific disease is called immunity.

Kinds of immunity


Immunity
Innate (Inborn/natural)
Acquired (during lifetime)
Non-specific (For infections in general)
Specific (For particular infections)
Active (Produced by one's own body)
Passive (Supplied from outside sources)
Natural (By previous infections)
Artificial (by vaccinations)
Natural (Antibodies received by foetus from mother's blood)
Artificial (Readymade antibodies produced in other animals)

Innate or inborn immunity

Certain infectious diseases can never occur in certain organisms because the antibodies are inherited from parents against the antigens which cause these diseases. This immunity is by virtue of genetic constitutional make up.

Adapted or acquired immunity

This type of immunity is achieved by the production of antibodies in the blood in response to the antigens or the entry of microbes. When any microbe invades the body, anitibody formation starts to combat these microbes. In case of first infection antibody formation is slow and disease may appear. Eventually, antibody formation is picked up and the disease disappears. Antibodies persist in the blood for a long time, may be for life, after first infection. These antibodies provide an immediate protection against further infection.

Acquired immunity is of two types :

(1) Active immunity : When an organism's own cells produce antibodies in response to infection or vaccination, it is called active immunity. It requires time for the formation of antibodies but it is long lasting.

Active immunity is of two types :

(i) **Vaccination or artificially acquired active immunity :** Vaccination is a technique to acquire immunity without infection. It is achieved through the introduction of weakened or killed pathogens or portions of pathogens. The doses of introduced pathogens are not able to cause the diseases but they are sufficient to induce the formation of antibodies in the blood. After that the body becomes immune to any possible infection of that disease.

Today, the vaccinations against typhoid, cholera, tuberculosis, measles, mumps and polio, etc. are given to the children to make them immune against these diseases. The immunity acquired through vaccination is called active immunity.

(ii) **Naturally acquired active immunity :** This is the resistance developed by an individual due to a previous infection or antigen (chemical found on the surface of the disease-causing germ cell) which enters his body naturally leading to naturally acquired active immunity.

In both the cases whether in artificially or naturally acquired active immunity, the body lymphocyes react in two ways:

(i) They produce antibodies which freely circulate in the blood and lymph, and which bind to the microorganism to kill it.

(ii) They produce killer cells carrying specific receptors for foreign antigens found on invading germs.

The actively acquired immunities are usually long-lasting carried out through 'memory' lymphocytes.

ALLEN

(2) Passive immunity : This is the immunity provided to an individual not by his own body but from an outside source in the form of "ready-made" antibodies. The passively acquired immunity again can be of two types :

(i) Naturally acquired passive immunity

(ii) Artificially acquired passive immunity

(i) Naturally aquired passive immunity : The readymade or the "pre-prepared" mother's antibodies may reach the foetus (developing embryo) through the placenta.

(ii) Artificially aquired passive immunity (Serums or antitoxins) : A serum is a blood preparation which is rich in antitoxins against a specific disease. Such sera are prepared by injecting small amounts of killed pathogens or toxins in the body of some vertebrates, such as, horse and rabbit. Introduction of these weakened or killed pathogens or toxins at intervals are sufficient to induce the formation of antibodies or antitoxins in their blood. In this way, the blood of the animals becomes rich in antibodies or antitoxins. The blood of these animals is drained out and chilled to remove the blood cells and fibrinogen, it is called serum. The serum is rich in antibiodies or antitoxins. Serum can be injected into the body of a patient of that disease or even to a healthy person. The antibodies present in the serum neutralize the antigens and the patient begins to recover.

This type of acquired immunity based on the antibodies or antitoxins from sources other than the patient's own cells is called passive immunity. Today, antitoxins are available for tetanus, diphtheria, scarlet fever and snake venom.

4.8 Some infectious diseases

[I] Diseases Caused by Virus

1. Hepatitis

Hepatitis or jaundice virus infects the liver; it is thus, a disease of liver. Hepatitis is caused by any of half a dozen viruses: hepatitis A virus (HAV), hepatitis B virus HBV), hepatitis C virus (HCV), hepatitis D virus (HDV), hepatitis E or G virus. Hepatitis B is a DNA virus and the rest are RNA viruses.

Symptoms

Its symptoms are high body temperature, headache, joint pains, loss of appetite with feeling of nausea and vomiting, irritating rashes over the body and emission of dark yellow urine and light coloured stool after a few days of its occurrence.

Transmission

Its major route of transmission is faecal-oral route. It may occur by direct (person-to-person) contact or indirectly by way of contaminated water, food or milk. It is transmitted by infected blood and blood products through transfusion, dialysis, contaminated syringe and needles, pricks of skin, etc.

2. Rabies (Hydrophobia)

It is an acute, highly fatal viral disease of the central nervous system. It is caused by Lyssa virus type I. It is a disease of warm-blooded animals, such as dogs, cats, monkey, rabbits, etc. It is transmitted to man usually by bites or licks of rabid animals. The virus is excreted in the saliva of affected animals. The virus may be present in the saliva for 3 to 4 days before the onset of symptoms and during the course of illness till death.

Symptoms

Its virus multiplies at the site of bite and then spread into the peripheral nervous system and finally to the central nervous system. The disease begins with headache, sore throat and slight fever lasting for 3 to 4 days. Later, patient becomes sensitive to noise, bright light or a cold drought of air, pain in the pharyngeal and neck muscles, muscular pain along with dilation of pupils, increased perspiration, salivation, fear of death, anger, irritability and depression. The symptoms are progressively increased and swallowing of liquid becomes unsuccessful. The patient develops fear of water (hydrophobia). The duration of illness is 2 to 3 days and may be prolonged to 5 to 6 days. The patient may die abruptly or pass on to the stage of paralysis and coma.

ALLEN

3. AIDS (Acquired Immuno-deficiency Syndrome)

It is sometimes called slim disease. It is usually a fatal illness caused by a retrovirus (RNA virus) known as human immuno-deficiency virus (HIV). It breaks down the immune system of the body. The victim becomes vulnerable to a host of life- threatening infections, It perpetuates in the human cells, T4 lymphocytes, which are actively dividing blood cells. It can remain in lymphoid cells in a latent state. It has the ability to destroy human T4 helper cells (lymphocytes). It spreads throughout the body. It can pass through the blood-brain barrier and destroy brain cells, causing neurological and psychomotor abnormalities.

Source of Infection

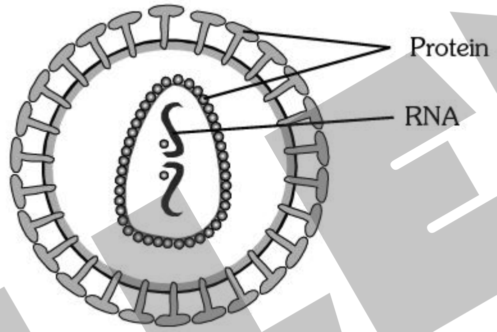
Blood and semen are the main sources of infection, HIV is found in them in greatest concentration.

Symptoms

AIDS patient shows signs of unexplained diarrhoea lasting more than a month, fatigue, bodily discomfort (malaise), loss of body weight, fever, night sweats, etc. AIDS is the end stage of HIV infection. In this disease lymph nodes swell, blood platelets count decreases that cause haemorrhage and fever.

Diagnosis

ELISA (Enzyme linked immunosorbent assay) and Western Blot test.



Diagrammatic representation of the human immunodeficiency virus (HIV)

Transmission

The virus is transmitted from person to person, mostly through sexual activity.The modes of infections are as follows:

(i) It is a sexually transmitted disease. AIDS spreads through unprotected (without condom) sexual intercourse with an HIV infected person.

(ii) Transmission of HIV virus in woman during intercourse is more than to man in reverse, since concentration of HIV is very high in semen than that of vaginal and cervical secretions.

(iii) AIDS is also transmitted by contaminated blood-transfusion.

(iv) It is also transmitted through a contaminated needle and syringe.

(v) HIV also passes from an infected mother to her foetus through the placental barrier or to her baby during delivery or by breast feeding.

Prevention and Control

The following are the basic approaches for the control of AIDS.

(1) **Education:** Provide health education to the adults :
   (i) To avoid indiscriminate sex.
   (ii) Use condoms.
   (iii) To avoid use of common razors and toothbrushes.
   (iv) Intravenous drug users should avoid common needles and syringes.
   (v) Infected women should avoid pregnancy, otherwise the newly born will also be infected with HIV.

ALLEN

(2) Infected persons should not donate blood, body organs, sperm or other tissues. All blood should be tested for HIV 1 and HIV 2 before transfusion.

(3) Disposable syringes and needles should be used.

4. Polio

Polio (Poliomyelitis) is caused by a small virus having a single stranded RNA as a genetic material. Like rabies and encephalitis it affects the central nervous system. Polio virus enters the body through contaminated food and water. It multiplies in lymphoid tissues such as tonsils causing vomiting, intestinal cramps, nausea and influenza. This causes paralysis in muscles of arms and legs, etc. controlled by the spinal cord.

Prevention and control

Sabin developed live attenuated (oral) polio virus vaccine (OPV) and it is used worldwide for the prevention of paralytic poliomyelitis.

[II] Diseases Caused by Bacteria

1. Tuberculosis (T.B.)

It was first discovered by Robert Koch (German scientist) in 1882 who got Nobel Prize in 1905. Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*. It is usually a chronic disease, showing varying symptoms.

Prevention and control

BCG (Bacillus-Calmette-Guerin) is the only widely used live bacterial vaccine. It prevents tuberculosis. It is given intramuscular and no other injection should be given for at least six months into the arm which received BCG vaccine. It protects the person from T.B. for 15 to 20 years. It gives immunity against *Mycobacterium tuberculosis.*

2. Cholera

Cholera is diarrhoeal disease caused by *Vibrio cholerae.* It is characterised by the sudden onset of profuse, watery diarrhoea followed by vomiting, rapid dehydration, muscular pain and suppression of urine. It may be fatal if fluid and electrolytes are not given timely.

3. Typhoid

Typhoid fever is a communicable disease and occurs in all parts of the world where water supplies and sanitation are sub-standard. It occurs more among males than females, probably as a result of increased exposure to infection. Outside the human body the bacteria is found in water, ice, food, milk and soil. It does not multiply in water.

Transmission

Typhoid is transmitted directly through soiled hands contaminated with faeces or urine of patients or carriers. It is also transmitted by the ingestion of contaminated water, milk or food or through house flies.

Symptoms

It is characterised by continuous high fever for 3 to 4 weeks, weakness, slow pulse, etc. diarrhoea may also occur. Fever with headache.

Prevention and Control

(i) Drinking water supplies should be protected and purified.

(ii) Basic sanitation should be improved.

(iii) Food hygiene is also an essential major factor to interrupt the transmission of typhoid fever.

(iv) Immunisation is the only specific preventive measure. The vaccine is TAB vaccine, which contains *S. typhi*, *S. paratyphi.*

Chloromycetin is the effective drug for its cure.

ALLEN

[III] Diseases caused by Protozoa

1. Malaria

Malaria (mal meaning bad + aria meaning air) is a protozoan disease caused by the genus Plasmodium (Malaria parasite). It is transmitted to man by the bite of infected female Anopheles mosquito. They bite mostly at night.

Agent

Malaria in man is caused by four distinct species of malaria parasite:-

Plasmodium vivax

P. falciparum

P. malariae

P. ovale

Malaria parasite's hosts are man and mosquito. Its life cycle passes in both, in man asexual cycle and in mosquito sexual cycle.

Symptoms

This is characterized by a sudden appearance of fever with pain and sensation of extreme cold shivering (cold stage). Temperature rises upto 106°F and the patient feels burning hot, intense headache, faster respiration and heart beat (Hot stage). Fever later comes down with profuse sweating. This occurs either daily at a particular time or is repeated every third or fourth day depending upon the species of the parasite (sweating stage).

It is characterised by the enlargement of spleen and anaemia.

Prevention and Control

Indoor residual spraying with DDT (Dichloro diphenyl trichloroethane), B.H.C. (Benzene hexachloride) or malathion twice a year is effective in controlling the mosquito. These chemicals kill the mosquitoes.

(i) Chloroquine kills the malarial parasite in human body. It is an effective drug for controlling malaria. Quinine is extracted from the bark of Cinchona tree.

A combination of chloroquine and primaquine is more effective.

(ii) Individual protection: Vector (mosquito) bite can be reduced by the use of repellents, mosquito nets, mosquito coils, screening of houses, that is use of wire gauged doors and windows, etc.

(iii) For killing the larvae of mosquitoes in standing water, kerosene oil is spread over the water.

ALLEN

4.9 Deficiency Diseases

A disease caused due to lack of a nutrient such as carbohydrates, fats, proteins, vitamins and minerals in the diet is called a deficiency disease. Deficiency diseases are also called nutritional disorders, which are of two types: overnutrition and undernutrition. Deficiency diseases are of the following types:

1. Protein-Energy Malnutrition (PEM)
2. Vitamin deficiency
3. Mineral deficiency

1. Protein-Energy Malnutrition (PEM)

Protein-energy malnutrition is a major health and nutrition problem in India. It occurs particularly in the children in the initial years of life. It causes permanent damage in physical as well as mental growth of the children if they survive. PEM diseases are Kwashiorkor and Marasmus.

(I) Kwashiorkor

It occurs due to protein deficiency in the diet, especially in the children in the age group 1 to 5 years. If their protein intake is less than 1 gram per kg of body weight per day, they suffer from this disease. Kwashiorkor is an African word meaning "rejected child". It occurs due to premature termination of breast feeding and feeding on protein deficient diet, i.e., only carbohydrates and fats. This is also called weaning.

Symptoms

Kwashiorkor baby becomes restless and irritable; skin becomes scaly, dark and cracked; hair often become sparse, straight, silky and dispigmented (i.e., reddish or greyish). Body shows oedema, i.e., becomes swollen due to retention of water by the cells, belly becomes protruded and limbs become long, thin, curved and bony. Face has bulging eyes. Mental development is also retarded. Liver gets damaged and finally the child dies before the age of five.

Cure

If protein-rich diet is given to such a child, he survives. Protein-rich diet from animals or from soyabean or a combination of wheat, gram, peanuts and jaggery provides relief to the sufferer.

(II) Marasmus

Marasmus (L., Marasmus means - 'to decay') means decaying of the body. Nutritional marasmus is frequent than Kwashiorkor. It is primarily due to an inadequate intake of food both in quantity and quality. When breast-feeding of children below the age of one is replaced by less nutritive food which is low in protein and calories, then such children show decline in weight and wasting of body muscles and subcutaneous fat. Limbs become thin due to wasting of muscles. Ribs are visible due to loss of fat and muscles. Intestinal digestion is disturbed. They also show decline in body growth Thus, the children become lean and thin, skin becomes shriveled, eyes sunken and mental growth is also retarded.

Preventive Measures

(i) Lactating mother should get rich food supplements so that she may provide breast feed to the child.

(ii) Child's diet must contain protein and energy-rich foods such as wheat, gram, peanut, soyabean and jaggery or egg, mutton, chicken, fish and milk.

(iii) Children should also be immunised against diseases that occur due to malnutrition.

Difference between Kwashiorkor and Marasmus

Kwashiorkor	Marasmus
1. Occurs due to deficiency of protein in the diet.	Occurs due to deficiency of protein, carbohydrate and fat in the diet.
2. Child shows oedema (swelling) in lower legs, lower arms and usually in face.	No swelling (oedema).
3. Wasting of muscles, sometimes hidden by oedema and fat.	Muscle wasting is obvious.
4. Subcutaneous fat often retained but it is not firm.	Severe loss of subcutaneous fat.
5. Weight according to height is low.	Weight according to height is very low.
6. Irritable, moaning and apathetic.	Quiet and apathetic.
7. Appetite is poor. Skin without any change.	Appetite usually good. Skin with diffused pigmentation and flaky.
8. Hair sparse, silky and dispigmented.	Hair sparse and silky, easily pull out.
9. It occurs in children from one to five years of age.	It occurs in infants upto 1 year of age.

ALLEN

2. Deficiency of vitamins: Table lists the various types of vitamins, their functions, their deficiency diseases, symptoms and sources.

Vitamin	Function	Deficiency disease	Symptoms	Sources
A (Retinol)	Keep eyes, hair, and skin healthy.	Night blindness	Dryness of eyes, Improper vision.	Green leafy vegetables and fruits, butter, egg yolk, carrots and fish
B1 (Thiamine)	Helps in digestion; maintains nervous system.	Beriberi	Inflammation (a condition characterized by redness and/or swelling) of nerves. Digestive problems and heart abnormalities.	Eggs, whole grains, sprouts
B2 (Riboflavin)	Keeps skin and mouth healthy.	Skin disorders	Irritation of eyes, Skin and intestinal disorders, Inflammation of the tongue.	Eggs and milk, green vegetables
B12 (Cyanocobalamin)	Formation of red blood cells.	Anaemia	Pale skin, lack of stamina and appetite, and frequent headaches.	Meat
C (Ascorbic acid)	Helps to resist infections and keeps teeth, gums, and joints healthy.	Scurvy	Loosening of teeth Spongy and bleeding gums, Increased susceptibility to diseases, Slow healing of wounds Weakness, Pain in the limbs.	Citrus fruits such as lime, orange, and lemon, tomatoes and sprouts.
D (Calciferol)	Aids in the normal growth of bones in children.	Rickets	Weak bones, Joint and bone deformities such as bow legs and pigeon chest, Softening of ribs, Protruding abdomen.	Milk, fish, and eggs, Sunlight
K	Helps in blood clotting.	Haemorrhage (excessive bleeding)	Affects clotting of blood.	Spinach, cabbage, or any other green leafy vegetable

ALLEN

3. Deficiency of water in the body : Water is also essential for the proper functioning of our body.

Excess loss of water from the body causes a condition called dehydration.

Dehydration causes loss of salts and leads to weakness in the body. An Oral Rehydrating Solution (ORS) can be given to the patient to recover from dehydration. It is available free of cost at primary health centres. It can also be made at home.

EXERCISE

Multiple choice questions

1. Which of the following insects carries the virus that causes Dengue?
(1) Aedes mosquito (2) Culex mosquito
(3) Anopheles mosquito (4) Tse-tse fly

2. Which of the following carries the parasite that causes malaria?
(1) Culex mosquito (2) Anopheles mosquito
(3) Aedes mosquito (4) Tse-tse fly

3. Which of the following is a cause for elephantiasis?
(1) *Leishmania* (2) It is genetic in origin
(3) *Trypanosoma* (4) *Wuchereria bancrofti*

4. Which of the following is not a viral infection?
(1) Pertussis (2) Rabies
(3) Rubella (4) Chicken pox

5. Which of the following are types of disease-causing agents?
(1) Viruses, bacteria and fungi (2) Measles, mumps and chicken pox
(3) Cholesterol, saturated fat and helminthes (4) All of the above

6. Which of the following is an air borne disease?
(1) Tuberculosis (2) Malaria
(3) Typhoid (4) Leprosy

7. Which of the following diseases spreads through infected needles or blood transfusion?
(1) Hepatitis B (2) AIDS
(3) Measles (4) Both (1) & (2)

8. Infectious diseases spread
(1) only through mosquitoes (2) from a healthy person
(3) from a patient to a healthy person (4) only through droplets

9. Which of the following is a genetic disease?
(1) Rickets (2) Kwashiorkor
(3) Haemophilia (4) Marasmus

10. Match the following and select the correct answer.

i. Measles	a. Protozoa
ii. Cholera	b. Virus
iii. Kala azar	c. Bacteria

(1) i - a, ii - c, iii - b (2) i - a, ii - b, iii - c (3) i - b, ii - a, iii - c (4) i - b, ii - c, iii - a

11. Which of these statements listed below is true about common cold?
(1) Common cold is not contagious.
(2) Common cold usually takes two months to clear up.
(3) The common cold virus can leave the body through the mucus of infected people.
(4) All of these

12. Sexually transmitted disease is
(1) AIDS (2) Syphilis
(3) Hepatitis B (4) All of the above

13. Wuchereria is found in
(1) Lungs (2) Lymph nodes
(3) Blood cells (4) Liver cells

14. Which of the following is a pair of viral diseases?
(1) Typhoid, Tuberculosis (2) Dysentry, Common cold
(3) Ringworm, AIDS (4) Common cold, AIDS

ALLEN

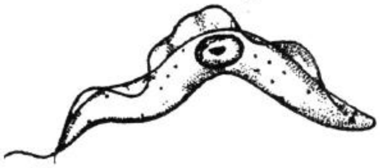
15. The given pathogenic organism causes which of the following diseases?

(1) Kala-azar

(2) Syphilis

(3) Dengue

(4) Sleeping sickness



16. Which among the following is an odd one?

(1) Kala-azar (2) Elephantiasis

(3) Amoebic Dysentery (4) Sleeping sickness

17. Sort out acute and chronic diseases given below and select the correct option.

(i) Elephantiasis (ii) Asthma (iii) Measles (iv) Dysentery

(v) Cholera (vi) Cancer (vii) Diabetes (viii) Diarrhoea

	Acute diseases	**Chronic diseases**
(1)	(i), (ii), (iii), (v)	(iv), (vi), (vii), (viii)
(2)	(ii), (iv), (vii), (viii)	(i), (iii), (v), (vi)
(3)	(iii), (iv), (v), (viii)	(i), (ii), (vi), (vii)
(4)	(iii), (iv), (v), (vi)	(i), (ii), (vii), (viii)

18. Match Column-I with Column-II and select the correct option from the codes given below.

Column-I	**Column-II**
(a) Hepatitis	(i) Ulcers in stomach and duodenum
(b) Typhoid	(ii) Reduction in natural immunity of the body
(c) Helicobacter pylori	(iii) Spreads by contaminated food
(d) AIDS	(iv) Painful contraction of muscles of throat and chest
(e) Rabies	(v) Acute inflammation of liver caused by virus

(1) (a)-(i), (b)-(ii), c-(iii), (d)-(iv), (e)-(v) (2) (a)-(v), (b)-(iii), c-(i), (d)-(ii), (e)-(iv)

(3) (a)-(iii), (b)-(i), c-(iv), (d)-(ii), (e)-(v) (4) (a)-(ii), (b)-(iv), c-(iii), (d)-(v), (e)-(i)

19. Refer the given statements and select the correct option.

Statement 1 : Hepatitis is a communicable disease.

Statement 2 : Hepatitis can pass from an infected person to a healthy person.

(1) Both the statements 1 & 2 are true and statement 2 is the correct explanation of statement 1.

(2) Both the statements 1 & 2 are true but statement 2 is not the correct explanation of statement 1.

(3) Statement 1 is true but statement 2 is false.

(4) Both the statements 1 & 2 are false.

20. Given below are four statements (a-d) each with one or two blanks. Select the option which correctly fills up the blanks in the two statements.

(a) Plague is caused by __(i)__ a deadly bacterium.

(b) Filariasis is characterised by swelling of the __(i)__ and of other parts of the body. The disease, therefore, is commonly known as __ (ii)__, due its resemblance to leg of an elephant.

(c) __(i)__ is the resistance to infection which an individual possesses by virtue of his/her genetic and constitutional make up.

(1) (b)-(i) Neck, (ii) Goitre (c)-(i) Autoimmunity

(2) (a)-(i) *Bordetella pertussis* (c)-(i) Passive immunity

(3) (a)-(i) *Yersinia pestis*, (c)-(i) Innate immunity

(4) (b)-(i) Leg, (ii) Elephantiasis (c)-(i) Acquired immunity

ALLEN

21. Vaccination

(1) develops resistance against the attack of a disease

(2) can control every disease

(3) kills all the disease causing organisms in the area

(4) involves the use of antibodies

22. Which of the following cells are involved in defence mechanism of the body?

(1) Neutrophils (2) Macrophages (3) Lymphocytes (4) All of these

23. The following symptoms were observed in a patient.

Swollen lymph nodes
Decreased lymphocyte count
Decreased immunity and weight loss

Which of the following could be the reason for the spread of the disease with the above symptoms?

(1) Contaminated food and water

(2) Inhaling infected droplets released by infected person

(3) Transfusion of blood from infected person to healthy person

(4) Through infected mosquito bite

24. Jenner prepared the vaccine for small pox by using

(1) Attenuated pathogen of small pox virus (2) Smaller doses of small pox virus

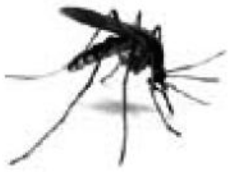
(3) Attenuated form of cow pox virus (4) Material from cow pox pustule

25. Match the column I (diseases) with column II (causative agents) and select the correct answer from the codes given below.

Column I	**Column II**
(a) Plague	(i) Rubeola virus
(b) Whooping cough	(ii) *Wuchereria bancrofti*
(c) Measles	(iii) *Salmonella typhi*
(d) Elephantiasis	(iv) *Yersinia pestis*
	(v) *Bordetella pertussis*
	(vi) *Entamoeba gingivalis*

	a	b	c	d
(1)	(iv)	(v)	(i)	(ii)
(2)	(i)	(v)	(ii)	(iv)
(3)	(iv)	(v)	(ii)	(i)
(4)	(vi)	(iii)	(v)	(ii)

26. Which of the following diseases is not transmitted by the vector shown in the given figure?



(i) Malaria (ii) Yellow fever (iii) Typhoid

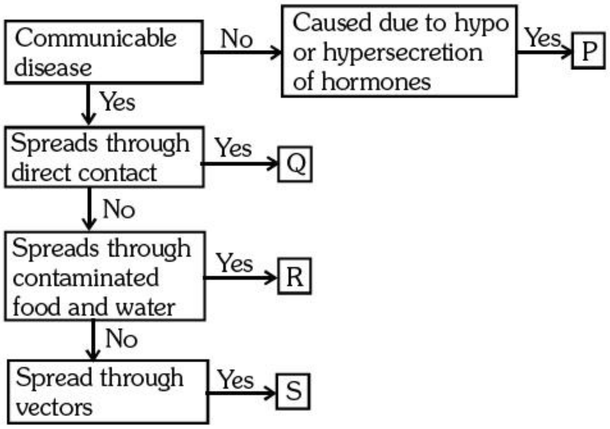
(iv) Sleeping sickness (v) Kala azar

(1) (ii), (iii) & (iv) (2) (i), (iii) & (v)

(3) (i) & (ii) (4) (iii), (iv) & (v)

ALLEN

27. Refer to the given flow chart and select the correct option regarding P, Q, R and S.


Communicable disease
No
Caused due to hypo or hypersecretion of hormones
Yes
P
Yes
Spreads through direct contact
Yes
Q
No
Spreads through contaminated food and water
Yes
R
No
Spread through vectors
Yes
S

(1) Disease P is caused due to malfunctioning of exocrine glands while diseases Q, R and S are caused by pathogenic microbes.
(2) S is a contagious disease while Q and R are non contagious diseases.
(3) Q could be Hepatitis B while R could be Kala azar.
(4) S could be Sleeping sickness while R could be Cholera.

28. Given below are some diseases caused by different pathogens such as bacteria, virus, fungi and protozoa.

(i) Typhoid, (ii) Athlete's foot, (iii) Tuberculosis, (iv) Anthrax,
(v) Malaria, (vi) Common cold, (vii) Amoebic dysentery, (viii) Yellow vein mosaic,
(ix) Influenza, (x) Pneumonia

Which of the following shows the correct category of diseases and their causative agents?

	Viral	Protozoan	Bacterial	Fungal
(1)	(vi)	(vii)	(iv)	(ii)
(2)	(i)	(vi)	(iv)	(iii)
(3)	(v)	(viii)	(x)	(ii)
(4)	(x)	(vi)	(ix)	(iii)

29. Goitre is caused by deficiency of

(1) iodine (2) iron (3) sodium (4) calcium

30. Read the symptoms, given below and identify the disease.

(i) Shivering
(ii) Headache
(iii) Fever
(iv) Swollen salivary glands in neck

(1) Chicken pox (2) Rabies (3) Polio (4) Mumps

ANSWERS

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	1	2	4	1	1	1	4	3	3	4	3	4	2	4	4	2	3	2	1	3
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**										
Ans.	1	4	3	4	1	4	4	1	1	4										

ALLEN